Fever Scans Offer False Sense of Security for Stopping the Spread of COVID-19

10/08/2020

A Study Conducted by Dr. Natalie Lambert and Survivor Corps

SCHOOL OF MEDICINE
DEPARTMENT OF MEDICINE

SURVIVOR CORPS

To cite this report, please credit: Lambert NJ, Survivor Corps, El-Azab S, Yu L, Esperanca A. *Fever Scans Offer False Sense of Security for Stopping the Spread of COVID-19.* **Indiana University School of Medicine [October, 2020]**

www.survivorcorps.com
www.nataliejlambert.com

Fever Scans Offer False Sense of Security for Stopping the Spread of COVID-19

Data collected: 8/24/2020 – 9/06/2020
Source: Indiana University IRB Approved Survey, Posted in the Survivor Corps Facebook Group and other online COVID-19 groups
Total Complete Responses: 3,963

Dr. Natalie J. Lambert, Associate Research Professor
Indiana University School of Medicine - Email: nalamb@iu.edu

To cite this report, please credit: Lambert NJ, Survivor Corps, El-Azab S, Yu L, Esperanca A. *Fever Scans Offer False Sense of Security for Stopping the Spread Of COVID-19.* Indiana University School of Medicine; October, 2020.

The results of this study are the reported experiences of people suffering from COVID-19 symptoms. This is not a peer-reviewed study. Data was analyzed by an experienced researcher and we invite any researchers interested in Survivor Corps data to contact us at HQ@survivorcorps.com.

Survivor Corps is a grassroots movement connecting, educating and mobilizing COVID-19 survivors with the medical, scientific and academic research community to help stem the tide of the pandemic and assist in the national recovery.

Context: As businesses, doctors' offices, and schools have reopened, many rely upon fever checks as a way of preventing people infected with COVID-19 from entering enclosed spaces where they could infect others. Fever checks do not detect the estimated 40% of people infected with COVID-19 who are asymptomatic.[1] The question remains as to whether fever checks can identify the remaining 60% of people who do experience symptoms when they contract COVID-19. This is an important question because organizational decision-makers need an accurate and easy-to-implement method for identifying people who are contagious in order to prevent the spread of COVID-19 within their organizations and communities.

Dr. Natalie Lambert at Indiana University School of Medicine and her research team collaborated with Survivor Corps to launch a detailed survey investigating COVID-19 survivors' experiences with the disease. Participants answered questions about their medical history, underlying medical conditions, demographic information, the timing and severity of symptoms they experienced, the impact of COVID-19 on their health and mental wellness, and their experiences seeking medical treatment for COVID-19 health impacts. Survivors Corps' founder, Diana Berrent, posted the link to the survey on the Survivor Corps Facebook Group and the link was shared with other online COVID-19 groups. This study is based on analysis of responses made by the 3,905 survey respondents who reported having symptomatic cases of COVID-19 (58 respondents who reported being asymptomatic were not included in this analysis).

Summary of Survey Findings:

- The heavy reliance on fever checks in COVID-19 screening policies is an insufficient method of preventing the spread of the disease. Only 7.66% of survey respondents reported fever within the first 10 days of COVID-19 illness, the window in which people are most likely to be contagious.[2] Since this analysis was of only symptomatic COVID-19 survivors, most of whom were not hospitalized, the survey results suggest that only about 4.6% of all people infected with COVID-19 (symptomatic and asymptomatic cases of COVID-19) experience fever in the first 10 days of illness.
- Fatigue (14.44%), cough (10.65%), headache (9.48%), shortness of breath or difficulty breathing (8.73%), inability to exercise or be active (8.02%), and changed sense of taste (7.71%) were all reported more frequently than fever (7.66%) during the first 10 days of COVID-19 illness. Updating screening policies to include the frequently reported early-onset COVID-19 symptoms identified by this study would likely bolster efforts to stem further spread of the disease.
- Our survey results indicate there is no single early-onset COVID-19 symptom that can act as an effective COVID-19 screening indicator. The CDC's list of recommended COVID-19 symptoms for self-screening assessment before entering clinics captures most of the frequently reported early-onset COVID-19 symptoms according to our survey. However, each individual symptom was reported by only a small percentage of individuals. The use of multiple indicators together as a screening tool is advisable.
- The fact that people infected with COVID-19 experience such a wide array of symptoms means that symptom-based COVID-19 screening can never be done with the level of confidence that organizational decision-makers need to protect their members and communities. The development of high accuracy rapid COVID-19 tests, if they can be produced affordably and in large enough numbers, is the best solution for keeping businesses and schools open while protecting communities from the spread of COVID-19.
- The results of this study demonstrate the importance of conducting research with more representative populations of COVID-19 survivors, especially in terms of hospitalization status and demographics. Previous research of hospitalized COVID-19 patients found that fever is a common symptom, occurring at the onset of illness in an average of 63.4[3]-99%[4] of hospitalized patients. Our study found that in our sample of mostly non-hospitalized COVID-19 survivors, only 7.66% reported early-onset fever. COVID-19 policies based on hospitalized patients' experiences, such as with fever, may not address how COVID-19 manifests in the majority of those infected with the disease.

Dr. Lambert and her research team collected and analyzed the survey responses. The results are broken down in the following figures:

- Figure 1: Age of Survey Respondents
- Figure 2: Race or Ethnicity of Respondents
- Figure 3: Gender of Respondents
- Figure 4: Respondent COVID-19 Diagnosis Method

- Figure 5: Percent of Respondents Reporting Each Symptom within First 10 days
- Figure 6: Respondents Reporting Fever By Diagnosis Type
- Figure 7: CDC Table of COVID-19 Symptoms That Are Common In Other Illnesses
- Figure 8: CDC COVID-19 Symptom Self-screening Poster for Clinics
- Figure 9: CDC Recommended COVID-19 Self-screening Symptoms (shaded) vs. % Respondents Reporting Each COVID-19 Symptom Occurring in First 10 Days of Illness

Research summarizing studies of COVID-19 patients found that fever is a common symptom, occurring at the onset of illness in an average of 63.4[3]-99%[4] of hospitalized patients. However, the current hospitalization rate in the United States reported by the CDC is 178.2 per 100,000,[5] or .18%. People who are infected with COVID-19 but not ill enough to be hospitalized represent the vast majority of COVID-19 patients, but we have little official health data on these patients since most are encourage by their doctors to recover at home. People who are not ill enough to be hospitalized are also the group most likely to be entering public places while contagious. Fever screening is commonly used to keep customers, students, and patients infected with COVID-19 from entering a public space where they could infect others. However, we have little data about how common early-onset fever is for people who have mild to moderate cases of COVID-19. There is therefore a need for research of COVID-19 symptom presentation within a sample of COVID-19 survivors that is more representative of the general patient population.

We created a research study that evaluates whether fever alone is an effective screening method for COVID-19. We asked the following research questions:

1. During their most contagious period (the first 10-days after onset of symptoms[2]), how commonly do COVID-19 survivors report having a fever?
2. If fever is not a good indicator that someone with COVID-19 is infectious, what symptoms are better indicators?

Method: To answer these questions, Dr. Natalie Lambert and her research team at Indiana University School of Medicine collaborated with Survivor Corps to conduct an IRB-approved survey of people experiencing COVID-19 symptoms. Anyone experiencing COVID-19 symptoms and over the age of 18 was eligible to participate. A link to the survey was posted on the Survivor Corps Facebook page and website as well as several other COVID-19 online groups. The study was advertised through these groups with the goal of recruiting as many non-hospitalized participants as possible. The survey was complete by 3,963 participants; 89.94% reported never being hospitalized during their illness, 14.44% reported being hospitalized, and 0.61% reported "other." 58 respondents did not report symptoms and were removed from the dataset, resulting in a dataset of 3,905 symptomatic COVID-19 survivors.

Figures 1-3 show participants' demographics.

Figure 4 shows the COVID-19 diagnosis methods reported by participants: 48.91% reported a positive test, 27.27% reported diagnosis by a doctor, 19.15% reported self-diagnosis from symptoms, and 4.66% reported "other."

Figure 5 reports the number and percentage of respondents who reported each symptom during their 10-day infectious window, thereby indicating which symptoms could be useful screening indicators for COVID-19. Survey participants reported each COVID-19 symptom they experienced along with information about how many days after the onset of COVID-19 each symptom began. Using these data points, we calculated how often each symptom was reported to occur within a 10-day window from participants' onset of symptoms (the period when they were most likely to be contagious).

For **Figure 6** we calculated the diagnosis method for all respondents who reported fever. Results show that the most common method of COVID-19 diagnosis for people who had fever was via a positive COVID-19 test (40.8%), followed by diagnosis by a doctor (35.12%), self-diagnosis from symptoms (20.07%), and other (4.01%). This is very similar to the proportions of diagnosis method for all symptoms.

Figure 7 is a chart from the CDC's website which compares symptoms of common illnesses (strep throat, the common cold, flu, asthma, and allergies) to the symptoms of COVID-19. We used this to determine which early-onset COVID-19 symptoms found by our study are unique compared to the symptoms other common illnesses

Figure 8 is a poster developed by the CDC encouraging COVID-19 multi-symptom self-screening at medical clinics.

Finally, in **Figure 9** we compared the screening symptoms listed on the CDC's poster in Figure 9 to the early-onset symptoms identified by this study to evaluate whether the CDC list captures the most frequent early-onset COVID-19 symptoms according to the results of this study.

Interpretation of Findings: Of the 3,905 survey respondents, 1,512 (38.7%) reported experiencing fever or chills. However, only 299 (7.66%) respondents reported that they had fever or chills within the first 10 days of illness. It is important to remember that the results of our study only represent the approximate 60% of people who are symptomatic, meaning they experience COVID-19 symptoms. An additional 40% of the population is thought to have COVID-19 but experience no symptoms. They are however able to infect others during their contagious period. Using these assumptions,[1] if 7.66% of symptomatic COVID-19 survivors report fever in the first 10 days, that would amount to only 4.6% of the total population of people infected with COVID-19 (symptomatic and asymptomatic combined) having fever during the first 10 days of illness (.0766 X 60 = 4.6 out of 100). In other words, if 100 people are infected with COVID-19, an average of 95.4 of them would pass a fever check and unknowingly pass along the virus

to others. Therefore, based on the evidence resulting from this study, fever is not a good indicator that people with mild to moderate cases of COVID-19 are contagious.

Analysis of study participants shows that fatigue (14.44%), cough (10.65%), headache (9.48%), shortness of breath or difficulty breathing (8.73%), inability to exercise or be active (8.02%), and changed sense of taste (7.71%) were all reported more frequently than fever (7.66%). In the survey, 101 symptoms identified as COVID-19 symptoms through official health information sources and our previous research[6] were provided to participants. Only 2 of these symptoms, fatigue and cough, were reported by more than 10% of respondents as occurring in the first 10 days of illness. These results suggest that no one symptom is a clear indicator of the infectious stage of COVID-19.

How frequently a symptom occurs during the first 10 days of COVID-19 illness onset is not the only information we can use to identify useful COVID-19 screening symptoms. We should also consider which early-onset COVID-19 symptoms are unique to COVID-19 and are not typically present in other illnesses. Figure 8 is a chart from the CDC's website which compares symptoms of common illnesses (strep throat, the common cold, flu, asthma, and allergies) to the symptoms of COVID-19. Common COVID-19 symptoms found by this study that are unique compared to other common illnesses are: headache, shortness of breath or difficulty breathing, inability to exercise or be active, changed sense of taste, abdominal pain, and difficulty concentrating or focusing. In particular, shortness of breath or difficulty breathing, experienced by a patient with no history of asthma, could be a good indicator of COVID-19 infection.

Finally, we compared the results of our survey to the set of COVID-19 symptoms recommended by the CDC for use in self-screening of COVID-19 infection prior to entering a clinic (Figures 9-10). The CDC list captures the majority of the most frequently reported early-onset COVID-19 symptoms found in our survey. However, the results of our study demonstrate that we cannot consider any one of these symptoms alone to be a reliable or definitive screening tool since each individual symptom was reported by only a small percentage of individuals.

Without access to rapid COVID-19 tests, the results of our survey indicate that health policies preventing people who exhibit *any* symptom of illness from entering buildings are the most effective method for preventing the spread of COVID-19. However, such a strict and broad health policy would come at the cost of disruption of business and school activities. In addition, it would likely keep people who need health scans and medical treatment from accessing essential care.

Updating screening policies to incorporate both frequently occurring, early-onset COVID-19 symptoms (fatigue and cough) as well as symptoms unique to COVID-19 (headache, shortness of breath or difficulty breathing, inability to exercise of be active, changed sense of taste, abdominal pain, and difficulty concentrating or focusing) will help to increase the accuracy of symptom-based screening methods. However, the fact that people infected with COVID-19 experience such a wide array of symptoms indicates that symptom-based COVID-19 screening can never be done with the level of confidence that organizational decision-makers need to

protect their communities. Recent research has found that people who eat at restaurants are twice as likely to contract COVID-19,[7] which is a strong warning against having false confidence in fever and other symptom-based COVID-19 screening. Reliable, affordable, and plentiful rapid COVID-19 tests would offer a necessary solution to this problem.

Dr. Lambert's and Survivor Corps' research with long haulers and non-hospitalized COVID-19 patients has found that COVID-19 survivors' experiences often do not match official health information. Many of the people who took our survey are suffering from Long Term Covid-19 (LTC-19), a condition where COVID-19 health complications persist for many weeks or months after initial infection. The broad range of COVID-19 experiences are not well researched or understood and therefore are not well represented in health policy. This study of early-onset symptoms suggests that there may be other ways in which COVID-19 is experienced differently by hospitalized and non-hospitalized COVID-19 survivors, and we are working to investigate other factors that may be sources of these different experiences such as COVID-19 survivors' underlying health conditions, medical history, demographics, and socioeconomic status.

COVID-19 survivors are participating in research studies in huge numbers to help researchers answer important questions about COVID-19. These survivors are frustrated by their LTC-19 challenges and the medical community's nascent understanding of the disease and its consequences. Funding is needed to scale up essential research efforts. This funding must be dedicated to patient-focused research, as well as research that can help create effective COVID-19 health policies. Organizations like Survivor Corps are bringing COVID-19 stakeholders such as medical doctors, researchers, industry, policy makers, and COVID-19 survivors together, but we need financial support and commitment on par with that being given to Operation Warp Speed towards the development of a COVID-19 vaccine. A vaccine is an essential component to beating this pandemic, but we cannot ignore the need to implement better preventative policies to curb the spread of the disease, develop therapies that halt the damage COVID-19 does to the body early its progression, and help heal the hundreds of thousands of patients who are struggling to recover from LTC-19. Focused research designed to prevent the spread of COVID-19 and help heal the many COVID-19 survivors suffering from long-term health impacts must be a part of our country's recovery strategy.

***

Acknowledgements: We would like to thank the Indiana University Precision Health Initiative and the thousands of Survivor Corps members who are fighting the virus for their support. We would also like to acknowledge the over 200,000 people in the United States and over 1 million people worldwide who have lost their lives to the disease.[8]

Survivor Corps Facebook Group: www.facebook.com/groups/COVID19survivorcorps/

References:

1. Centers for Disease Control and Prevention. COVID-19 Pandemic Planning Scenarios. https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html Accessed October 8, 2020.
2. Centers for Disease Control and Prevention. Duration of Isolation and Precautions for Adults with COVID-19. https://www.cdc.gov/coronavirus/2019-ncov/hcp/duration-isolation.html Accessed October 8, 2020.
3. Fang Z, Yi F, Wu K, et al. Clinical Characteristics of 2019 Coronavirus Pneumonia (COVID-19): An Updated Systematic Review. medRxiv. 2020 March 10.
4. Jiang F, Deng L, Zhang L, et al. Review of the Clinical Characteristics of Coronavirus Disease 2019 (COVID-19). Journal of General Internal Medicine. 2020 March 4. 35: 1545-1549.
5. Centers for Disease Control and Prevention. COVIDView. https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html Accessed October 8, 2020.
6. Lambert, NJ & Survivor Corps. COVID-19 "Long Hauler" Symptoms Survey Report. Indiana University School of Medicine. 2020 July. https://static1.squarespace.com/static/5e8b5f63562c031c16e36a93/t/5f459ef7798e8b6037fa6c57/1598398215120/2020+Survivor+Corps+COVID-19+%27Long+Hauler%27+Symptoms+Survey+Report+%28revised+July+25.4%29.pdf
7. Centers for Disease Control and Prevention. Community and Close Contact Exposures Associated with COVID-19 Among Symptomatic Adults ≥18 Years in 11 Outpatient Health Care Facilities — United States, July 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6936a5.htm?s_cid=mm6936a5_w Accessed October 8, 2020.
8. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. *Lancet Infect Dis*; published online Feb 19. https://doi.org/10.1016/S1473-3099(20)30120-1. https://coronavirus.jhu.edu/map.html Accessed October 8, 2020.

Figure 1. Age of Survey Respondents

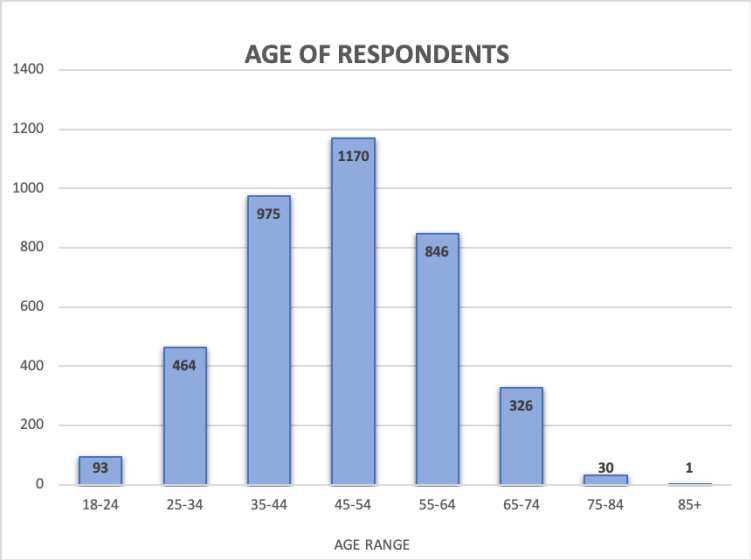

Figure 2. Race or Ethnicity of Respondents

Race or Ethnicity	# of Respondents	Percentage
White	3,173	81.25
Hispanic or Latino	248	6.35
Multiracial	193	4.94
Black or African American	125	3.20
Asian	73	1.87
Other	34	0.87
Middle Eastern/North African	31	0.79
American Indian or Alaska Native	24	0.61
Native Hawaiian Or Other Pacific Islander	4	0.10

Figure 3. Gender of Respondents

Gender	# of Respondents	Percentage
Female	3,292	84.30
Male	586	15.01
Non-binary/non-conforming	15	0.38
Unknown	9	0.23
Transgender	3	0.08

Figure 4. Respondent COVID-19 Diagnosis Method

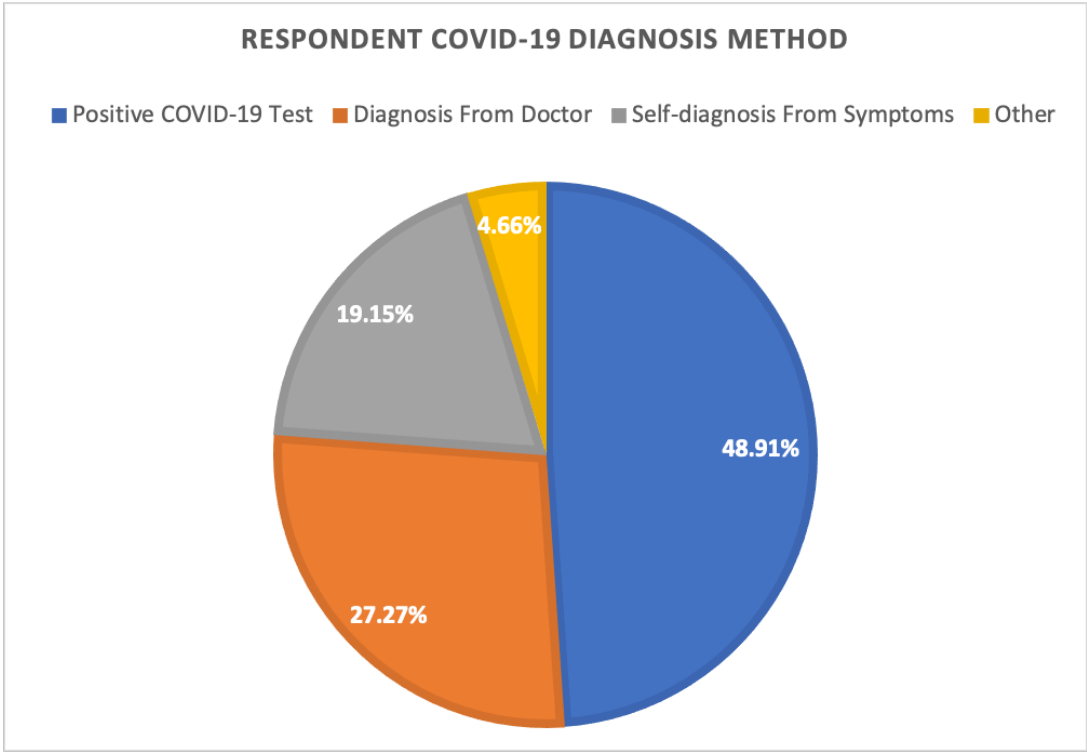

Figure 5. Percent of Respondents Reporting Each Symptom within First 10 days

Symptom	# *Total Respondents* Who Reported Experiencing This Symptom Within First 10 Days of Illness	% *Total Respondents* Who Reported Experiencing This Symptom Within First 10 Days of Illness
fatigue	564	14.44
cough	416	10.65
headache	370	9.48
shortness of breath or difficulty breathing	341	8.73
inability to exercise or be active	313	8.02
changed sense of taste	301	7.71
fever or chills	299	7.66
diarrhea	279	7.14
abdominal pain	259	6.63
difficulty concentrating or focusing	258	6.61
muscle or body aches	247	6.33
partial or complete loss of sense of smell	234	5.99
congested or runny nose	219	5.61
sleeping more than normal	215	5.51
bone aches in extremities	212	5.43
difficulty sleeping	211	5.40
partial or complete loss of sense of taste	204	5.22
sore throat	193	4.94
chills but no fever	186	4.76
anxiety	184	4.71
persistent chest pain or pressure	180	4.61
dizziness	171	4.38
nausea or vomiting	165	4.23
confusion	154	3.94
night sweats	150	3.84
heart palpitations	132	3.38
joint pain	125	3.20
changing symptoms	121	3.10
memory problems	107	2.74
tachycardia	103	2.64
constant thirst	102	2.61
shortness of breath or exhaustion from bending over	102	2.61
arrhythmia	97	2.48

blurry vision	93	2.38
weight loss	92	2.36
phlegm in back of throat	89	2.28
brain pressure	82	2.10
cold burning feeling in lungs	79	2.02
low blood oxygen	76	1.95
low temperature	74	1.90
feeling irritable	72	1.84
lower back pain	71	1.82
burning sensations	69	1.77
clogged ears	65	1.66
sadness	65	1.66
ear pain or ear ache	64	1.64
dry throat	60	1.54
post nasal drip	60	1.54
extreme pressure at base of head or occipital nerve	59	1.51
dry eyes	52	1.33
heat intolerance	52	1.33
calf cramps	50	1.28
sharp or sudden chest pain	48	1.23
cracked or dry lips	47	1.20
mid-back pain at base of ribs	47	1.20
neck muscle pain	47	1.20
neuropathy in hands and feet	47	1.20
tremors	47	1.20
costochondritis	44	1.13
feeling of burning skin	40	1.02
phantom smells	40	1.02
swollen lymph nodes	40	1.02
reflux	38	0.97
tinnitus	38	0.97
upper back pain	37	0.95
rash	36	0.92
hand or wrist pain	31	0.79
nerve sensations	31	0.79
bilateral neck throbbing around lymph nodes	29	0.74
muscle twitching	29	0.74
high blood pressure	27	0.69

covid toes	26	0.67
floaters or flashes of light in vision	23	0.59
mouth sores or sore tongue	23	0.59
eye stye or infection	22	0.56
foot pain	22	0.56
hot blood rush	20	0.51
swollen hands or feet	20	0.51
jaw pain	19	0.49
kidney pain	19	0.49
spikes in blood pressure	19	0.49
painful scalp	18	0.46
GERD with excessive salivation	16	0.41
low blood pressure	15	0.38
dry or peeling skin	14	0.36
irregular or skipped menstrual cycles	14	0.36
syncope	12	0.31
uti (urinary tract infection)	12	0.31
weight gain	12	0.31
bulging veins	11	0.28
kidney issues or protein in urine	11	0.28
thrush	11	0.28
goiter or lump in throat	10	0.26
menstrual cycles that are heavier or lighter than usual	9	0.23
herpes	8	0.20
hair loss	7	0.18
personality change (drastic)	6	0.15
anemia	5	0.13
dry scalp or dandruff	4	0.10
hormone imbalances	4	0.10
elevated thyroid	1	0.03

Figure 6. COVID-19 Diagnosis Method For Respondents Reporting Fever

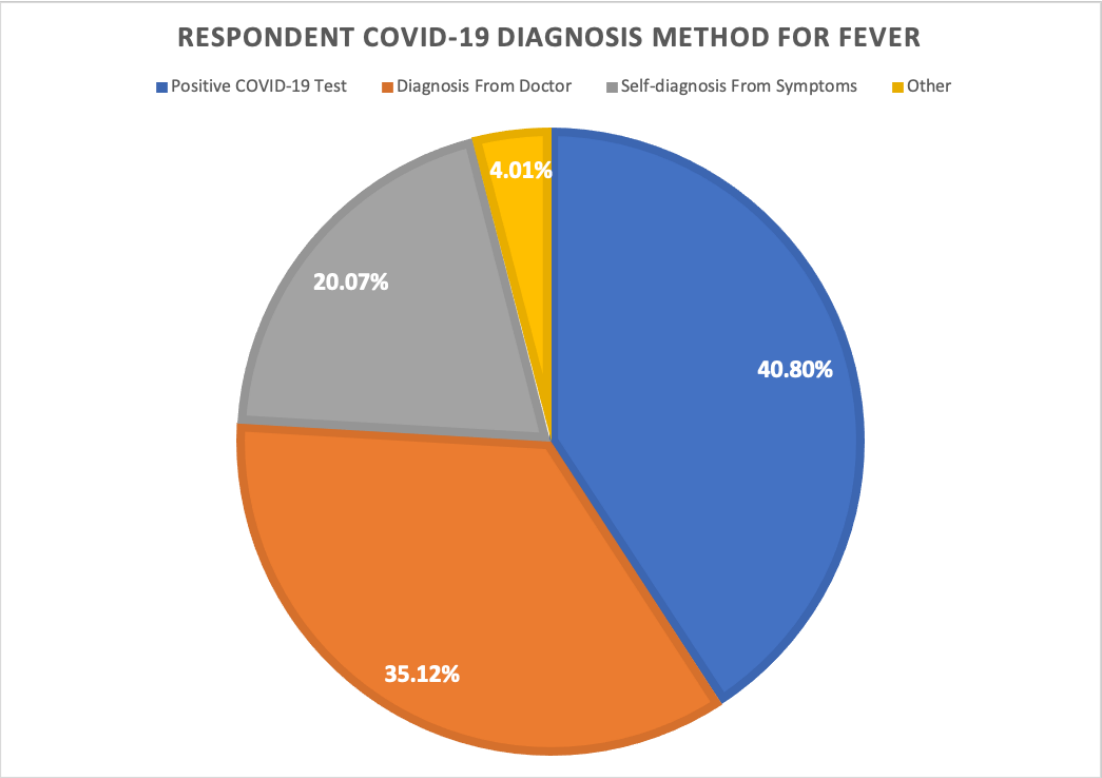

Figure 7. CDC Table of COVID-19 Symptoms That Are Common In Other Illnesses

Source: https://www.cdc.gov/coronavirus/2019-ncov/community/schools-childcare/symptom-screening.html on 10/08/2020

Table. Many symptoms of COVID-19 are also present in common illnesses

Symptoms of COVID-19	Strep Throat	Common Cold	Flu	Asthma	Seasonal Allergies
Fever or chills	X		X		
Cough		X	X	X	X
Sore throat	X	X	X		X
Shortness of breath or difficulty breathing				X	
Fatigue		X	X	X	X
Nausea or Vomiting	X		X		
Diarrhea	X		X		
Congestion or Runny Nose		X	X		X
Muscle or body aches	X	X	X		

Note: The table above does not include all COVID-19 symptoms

Available for Download

Figure 8. CDC COVID-19 Symptom Self-screening Poster for Clinics

Source: https://www.cdc.gov/coronavirus/2019-ncov/downloads/Please-Read.pdf on 10/08/2020

Figure 9. CDC Recommended COVID-19 Self-screening Symptoms (shaded) vs. % Respondents Reporting Most Common COVID-19 Symptoms Occurring in First 10 Days of Illness